Device for unrolling a coil of material in sheet form

The invention relates to a device for unrolling an elastic material in sheet form from a roll. The material concerned is material that has been wound on the roll under flexural pretension and consequently tries to return to the extended state from the rolled-up state. An example of such a material which may be mentioned is sheet metal, in particular sheet aluminium such as is used for the production of skin panels in aviation and aerospace. In this context the sheet aluminium can be used to make a laminate of various aluminium layers that are joined to one another by an adhesive fibre matrix material. Such laminates have a low weight in combination with excellent mechanical properties, such as high rigidity and strength, excellent fatigue characteristics and a high nick resistance to cracking.

Such laminates are usually made up of several layers. In order to keep the thickness of the laminate within certain limits, fairly thin sheet aluminium has to be used, for example with a thickness of between 0.2 and 0.5 mm. Such thin aluminium sheets are difficult to handle, also because of the highly elastic nature thereof that has been indicated above. Moreover, the aluminium sheet must not be damaged during processing. Any damage would have a severe adverse effect on the fatigue characteristics. This is unacceptable, especially in the case of applications in aviation and aerospace.

Increasingly large panels are being used for the skin of the body and the wings when constructing larger aircraft. For this reason as well it is becoming increasingly problematical to handle the fairly thin aluminium sheets used for this in an appropriate manner.

The aim of the invention is, therefore, to offer a solution to the problems that arise when handling thin sheets of material. This aim is realised with a device for unrolling an elastic material in sheet form from a coil, comprising a frame having an accommodation for said coil and a series of roller members, the axes of which are essentially parallel, said series of roller members is arranged in accordance with a curved path that adjoins an out-feed such that the coil can be supported by the series of roller members and the material in sheet form can be unrolled from the coil via the out-feed, the length of each rolling member being at least smaller than half of the width of said accommodation for said coil and successive rollers are offset with respect to one another in the direction of their axis and

overlap one another at least partially transversely to their axis.

By this arrangement the coil is substantially supported on each point during uncoiling.

Depending from the diameter the number of rolling members will be chosen.

The device is in particular suited for handling of relatively thin wide elastic material in sheet form. The thickness is for example between .1 and 1.0 mm more preferable between .2 and .6 mm. The width can be between .3 and 2 m, although larger widths are possible. The length of the coiled material can vary from several meters to many dozens of meters.

The coil of elastic material in sheet form can be placed in the device according to the invention while still in the restrained state. Restraint of the coil can then be released, which has the result that the material in sheet form starts to unroll under the influence of its pretension. However, this unrolling process is arrested as soon as the material in sheet form makes contact with the roller members. Unrolling then ceases, after which the material is ready to be fed out in a controlled manner via the out-feed. As a consequence of feeding out, the material unrolls ever further, during which operation said material is supported by the co-rotating roller members in a stable manner. During this operation the material is preferably fed out directly onto a table for further processing of the material.

In connection with reliable support, the curved path defined by the roller members preferably extends over more than 180 degrees. The series of roller members can comprise at least two sections which can be moved relative to one another between a position in which the series is regularly curved and a position in which the sections are a relatively large distance apart for inserting a coil between those sections. In this case one section of the series is fixed with respect to the frame and another section is movable. The series of roller members can thus be opened in order to place the coil of material in sheet form in the device; the device can then be closed so as to support the coil all round. The best guiding of the roll of material in sheet form is obtained if the series of roller members is arranged in accordance with a curvature of essentially 360 degrees.

The out-feed is defined between two successive roller members of the series which have a centre-to-centre distance that is greater than the spacing between the other roller members. Furthermore, the out-feed can have a set of roller members positioned in accordance with a straight path, which set adjoins the curved series.

The roller members can be constructed in a wide variety of different ways. For example, they can comprise a roller that is supported in the frame by means of a suitable bearing such that it is able to rotate. By overlapping arrangement of the roller members, and more particular the rollers, full support is obtained. Preferably at least two series of rollers are provided overlapping. However three, four or more rollers are positioned adjacent to each other, i.e. the length of each roller or roller member is a third, a quarter or less from the "width" of the accommodation for the roller.

The invention also relates to a method for uncoiling of an elastic material in sheet form from a coil, comprising positioning of said coil in an accommodation of a device and exerting a cooling force on the free extremity of said coil, wherein said coil is supported by a series of rolling members engaging to the circumference of said coil over at least 180° of the circumference of said coil on each point of said coil. If successive rollers are offset with respect to one another in the direction of their axis, the rollers can overlap one another transversely to their axis. With this embodiment excellent guiding of the roll is obtained because the spacing between the mutually offset rollers is relatively small.

The invention will now be explained in more detail below with reference to a few illustrative embodiments shown in the figures.

Figure 1 shows the principle of the device according to the invention.

Figure 2 shows a side view of a practical embodiment in the closed position.

Figure 3 shows a section according to III-III in Figure 2.

The device according to the invention shown diagrammatically in Figure 1 comprises a frame 1 in which a series 2 consisting of roller members 3 is accommodated. The series 2 has a virtually completely circular shape that is interrupted only at the location of the out-feed 4. This out-feed 4 opens onto a number of roller members positioned in accordance with a straight path 5.

As is shown, the series 2 comprises two sections 6, 7 that are joined to one another via a hinge 8. The section 6 can consequently, as is indicated by broken lines, be moved upwardly with respect to the second, fixed section 7 of the series 2. In the higher position a coil 9 of elastic material in sheet form can be placed in contact with the second part 7 of the series 2. The first section 6 of the series 2 is then pivoted back, as a result of which the position indicated by continuous lines is reached.

In this latter position the coil 9 is virtually completely surrounded by roller members

3. When the coil 9 is released, for example by removing therefrom tapes that hold it in the rolled-up state, the elastic material 10 in sheet form will initially unroll. This unrolling is stopped as soon as contact is made with the roller members 3. In this state the front portion of the roll can be unrolled to give a straight strip 10. This straight strip 10 can then be taken up on the roller members 3 positioned in accordance with a straight path 5.

When the coil 9 is unrolled in this way the thin, vulnerable material in sheet form is well protected against damage, as a result of which sheet material suitable for further processing is obtained on the straight path 5.

The embodiment shown in Figure 1 only shows the principle of the device according to the invention. A further developed illustrative embodiment of the device is shown in Figures 2 and 3. This device comprises the components already shown with reference to Figure 1, such as a first section 6, which is able to hinge, of the series 2 and a second, fixed section 7 of the series 2. These sections are accommodated on a frame part 11 that is joined by means of hinge 12 to a fixed frame part 13.

As shown in Figures 2 and 3 the roller members 3 are constructed as rollers 14, each of which is accommodated on an axle 15. Each axle 15 carries two such rollers 14, which are positioned offset with respect to the rollers 14 of the adjacent axles 15. The rollers 14 are consequently able to overlap one another to some extent in the peripheral direction of the series 2, as a result of which very good support of the coil 9 to be processed is ensured. This is particularly true for uncoiling the last turn of a coil. More particularly the extreme edge of the coil material is accurately guided along overlapping rollers. Because of that damage of this extreme portion is prevented and can have its proper use.

The following may be mentioned as examples of metals from which the sheet material can be made: Al, Ti, Sc, Cu, Mg and Li.